

The basic test for nonobvious subject matter is whether the differences between the subject matter and the prior art are such that claimed subject matter as a whole would not have been obvious to a person having ordinary skill in the art to which a subject matter pertains. The United States Supreme Court in *Graham v. John Deere & Co.*, 383 U.S. 1 (1966) set forth the factual inquiries which must be considered in applying the statutory test: (1) a determination of the scope and contents of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; and (3) resolving the level of ordinary skill in the pertinent art.

In determining the scope and contents of the prior art, the Examiner must first consider the nature of the problem on which the inventor was working. Once this has been established, the Examiner must select, for purposes of comparing and contrasting with the claims at issue, prior art references which are reasonably pertinent to that problem. In selecting references, hindsight must be avoided at all costs.

The problem the inventors were attempting to solve was to improve the emission characteristics of a field emitter device using a carbon film. In doing so, Applicants discovered that field emission from a carbon film was improved by treating the substrate onto which the carbon film is to be grown so as to modify a morphology of the substrate. When the carbon film is therefore deposited on such a substrate, the carbon film deposited over the treated areas has better emission characteristics than the carbon film deposited over the untreated substrate areas.

*Song* teaches a field emission device wherein the cathode is created by depositing successive layers of different materials, specifically a conductive layer 330, a resistive layer (ballast) 365, a surface emitter 370, and another resistive layer 375. The conductive layer 330 and the resistive layer 365 actually are deposited on and contact the substrate 310. These layers are produced by the process illustrated in Figures 10-13. As can be seen by viewing these figures and the accompanying disclosure, microelectronics-type manufacturing etching steps are performed to remove layers 369 and 377 after the emission layer 370 has already been deposited.

The present invention is different in that etching on the deposited emission layer is not required. An advantage of the present invention process is an ability to not subject the carbon layer to such microelectronics-type processing. Page 9, lines 14-18.

Moreover, the present invention treats the substrate to either change the morphology of the substrate or its chemical composition. *Song* does not in any way teach or suggest treating of the substrate in such a manner.

As a result, *Song* is not relevant to the present invention, and would not have been considered by the inventors when attempting to solve their problem, since their solution involves treatment of the substrate. Therefore, *Song* is not reasonably pertinent to the claims of the present invention.

In ascertaining the differences between the cited prior art and the claims at issue, the Examiner must evaluate the claimed subject matter as a whole; there is no requirement that any differences between the claimed subject matter and the cited references be "remarkable" nor that some technological discontinuity between the claimed invention and subject matter exists just outside the claims. The requisite view of the whole invention mandates consideration of not only its structure, but also of its properties and the problems solved. Further, the mere fact that the prior art can be modified does not make the modification obvious unless the prior art suggests the desirability of the modification; there must be some logical reason apparent from positive, concrete evidence that justifies the modification.

Claim 1 specifically recites treating of the substrate to modify a morphology of the substrate, and then growing a carbon film on the treated substrate. As noted above, *Song* does not in any way teach or suggest treating the substrate to modify its morphology. The term "morphology" is supported within the Specification on page 4, lines 2-5, and page 7, lines 15-21, which also discusses how treatments may change the chemical composition of the substrate surface. Instead, *Song* merely teaches that the surface emitter 370 is deposited on the previously deposited ballast 365. Treating of the substrate 310 is not performed.

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Claim 2 specifically recites that only a portion of the substrate is subjected to the treating step, and wherein the carbon film grown on the treated substrate is a better field emitter than carbon film grown on an untreated portion of the substrate. Again, since *Song* does not in any way teach or suggest treatment of the substrate, *Song* cannot in any way teach or suggest that a carbon film grown on a treated substrate is a better field emitter than a carbon film grown on an untreated portion of the substrate.

The same is true for Claim 3, which recites that the carbon film grown on the treated portion of the substrate emits substantially more electrons when subjected to a specified electric field than the carbon film on the untreated substrate.

Furthermore, the Examiner has asserted that "in the absence of unobvious results, it would have been obvious to one of ordinary skill in the art to determine through routine experimentation the optimum, operable area that the carbon film is more active, it is noted, that the reference (*Song*) uses the carbon on the substrate as the active area indicating to one of ordinary skill in the art the area of higher activity." Applicants respectfully assert that the Examiner's statement is misleading and without support. Regarding the Examiner's statement about "unobvious results," the Examiner is respectfully requested to refer to page 7, line 21 through page 8, line 2, and page 8, line 1 through page 9, line 10 of the Specification, wherein it is discussed how treatment of the substrate results in better emission from the carbon film over the treated portions, which contradicts the Examiner's position that there is an "absence of unobvious results." Applicants respectfully contend that treating of the substrate to achieve these results is not in any way taught or suggested by *Song*, nor is this taught or suggested anywhere within the prior art. Furthermore, such results are not obvious, and it is the Examiner's burden to prove that treating the substrate in such a manner to achieve such results is obvious by citing objective prior art evidence and not merely relying upon unsupported statements.

Furthermore, the Examiner's statement that it would have been obvious to determine through routine experimentation which part of the carbon film is more active does not support

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the Examiner's *prima facie* case of obviousness. Again, this statement by the Examiner is unsupported by any objective evidence. The present invention specifically recites that the carbon film above treated substrate portions will emit preferentially over carbon film deposited over untreated portions of the substrate. The claim language is not ambiguous in any way, and the Examiner must address this specific claim language by more than mere conclusionary statements. Furthermore, *Song* does not support the Examiner's position that "the reference uses the carbon on the substrate as the active area indicating to one of ordinary skill in the art the area of higher activity." In *Song*, the surface emitter 370 is deposited over ballast 365 in a specific location resulting in emission from that surface emitter 370. This does not suggest to one of ordinary skill in the art that a carbon film deposited over a treated substrate would emit better than a carbon film deposited over an untreated substrate. Again, the Examiner is respectfully reminded that *Song* does not in any way teach or suggest treating of the substrate in the manner specifically claimed.

Claim 12 specifically recites that the carbon film is deposited on the metal layer in addition to being deposited on the substrate. First, *Song* does not teach depositing the surface emitter 370 on the substrate 310. Instead, surface emitter 370 is deposited on ballast 365, which is deposited on substrate 310. Furthermore, *Song* does not teach or suggest depositing the surface emitter 370 onto the column conductor lines 330, as can be easily seen from the figures in *Song*.

The differences between Claim 14 and *Song* are the same as those discussed above with respect to Claims 1-3.

Claim 15 specifically recites that the substrate is treated with an acid. *Song* does not in any way teach or suggest treatment of the substrate, and as a result, does not in any way teach or suggest treating the substrate with an acid.

Claim 16 specifically recites that the substrate is ceramic. *Song* merely teaches that substrate 310 may be made from glass, such as, borosilicate glass, or silicon. Column 3, lines 63-64. Therefore, *Song* does not teach that the substrate is ceramic.

Claim 17 specifically recites that the carbon film is deposited on a portion of the substrate. As discussed above with respect to Claim 12, *Song* does not teach depositing the surface emitter 370 on the substrate 310.

Claim 18 specifically recites that the carbon film is also deposited on the metal layer in addition to the substrate. As discussed above, *Song* does not teach or suggest depositing the surface emitter 370 onto the column conductors 330.

In resolving the level of ordinary skill in the pertinent art, the Examiner must step backward in time and into the shoes worn by a person of ordinary skill when the invention was unknown and just before it was made. The hypothetical person skilled in the art can summarily be described as one who thinks along lines of conventional wisdom in the art and neither one who undertakes to innovate nor one who has the benefit of hindsight. Thus, neither an examiner, nor a judge, nor a genius in the art at hand, nor even the inventor is such a person skilled in the art.

As noted above, there are significant differences between the claims and *Song*. Foremost is the fact that *Song* does not in any way teach or discuss treatment of the substrate 310. As a result, one skilled in the art at the time the invention was made would not have been able to recreate the claimed invention in view of *Song*. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. MPEP § 2143.03; *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Furthermore, the Examiner has made statements as to what would have been obvious to one of ordinary skill in the art, and that the emission of electrons from the carbon film over treated substrate portions is not unobvious. However, the Examiner has not supported such

statements with objective evidence. The legal conclusion of obviousness must be supported by facts. *Graham v. John Deere & Co.*, 383 US 1 (1966).

As a result of the foregoing, Applicants respectfully assert that the Examiner has failed to prove a *prima facie* case of obviousness in rejecting Claims 1-3, 10-12, and 14-19 over *Song*.

Claims 4-9, 13, and 20-25 stand rejected under 35 USC § 103 as being unpatentable over *Song* in view of Yoshioka, et al (U.S. Patent No. 5,759,080). In response, Applicants respectfully traverse this rejection.

Claims 4-9, 13, and 20-25 all depend upon allowable claims. Therefore, these claims are allowable over the cited prior art.

The Examiner has stated that *Song* differs from the rejected claims in the means of changing the substrate morphology. Applicants respectfully assert that *Song* differs from the rejected claims more significantly, as discussed above, in that *Song* does not in any way teach or suggest changing the substrate morphology.

As a result of the foregoing, Claims 4-9, 13, and 20-25 are patentable over *Song* in view of Yoshioka.

Applicants respectfully request an early allowance of the claims.

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